

UNITED STATES PATENT APPLICATION

OF

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FOR

OUTER ROTOR TYPE MOTOR OF WASHING MACHINE

[0001] This application claims the benefit of Korean Application(s) No. 10-2002-0075373 filed on November 29, 2002, which is/are hereby incorporated by reference.

BACKGROUND OF THE INVENTION

5 Field of the Invention

[0002] The present invention relates to an outer rotor type motor of a washing machine, in which a rotor is more simply installed.

Discussion of the Related Art

[0003] Generally, a washing machine generates a water current using a rotation of a
10 tub or a pulsator on a bottom of the tub to perform washing. A rotational force of a motor of a washing machine can be transferred to the tub or pulsator in various ways. For instance, there are an indirect transfer of the rotational force by a connection of motor pulley and a direct transfer of the rotational force to a shaft of the tub or pulsator connected to a rotor of the motor.

15 [0004] Meanwhile, a motor is divided into an inner rotor type and an outer rotor type according to relative locations of stator and rotor.

[0005] The inner rotor type motor has the rotor provided in the stator. Yet, since the rotor rotates in the stator, the inner rotor type motor is limited in a rotational radius as well as produces less torque from the same volume. Moreover, the inner rotor type motor fails to
20 utilize an inner space effectively.

[0006] Lately, a rotor is provided outside a stator to increase torque from the same volume and to utilize the inner space of the stator for other use. Such a motor is called the outer rotor type motor.

[0007] In this case, the rotor is connected to a tub. Hence, the rotation of the tub

brings friction between water and laundry in the tub to perform washing. In order to transfer the rotational force of the rotor of the outer rotor type motor. It is important to connect the rotor to the inner tub stably.

[0008] However, the related art provides a complicated method of connecting the rotor to the tub. Hence, many efforts are made to develop the structure enabling to fix the rotor of the outer rotor type motor.

SUMMARY OF THE INVENTION

[0009] Accordingly, the present invention is directed to an outer rotor type motor of a washing machine that substantially obviates one or more of the problems due to limitations and disadvantages of the related art.

[0010] An object of the present invention, which has been devised to solve the foregoing problem, lies in providing an outer rotor type motor of a washing machine, by which a rotor of the outer rotor type motor is more simply fixed to a frame.

[0011] Additional features and advantages of the invention will be set forth in the description which follows, and in part will be apparent to those having ordinary skill in the art upon examination of the following or may be learned from a practice of the invention. The objectives and other advantages of the invention will be realized and attained by the subject matter particularly pointed out in the specification and claims hereof as well as in the appended drawings.

[0012] To achieve these objects and other advantages in accordance with the present invention, as embodied and broadly described herein, there is provided an outer rotor type motor including a stator having an outer circumference on which a coil is wound, a rotor provided to leave a predetermined interval from an outside of the stator, the rotor rotating

when a current is applied to the coil, and a frame having a fixing means for fixing the rotor wherein the fixing means is built in one body of an inner circumference of the frame.

[0013] In this case, a tip of the frame is bent inward to form the fixing means as a fixing part to clamp a topside of the rotor, and the fixing part is bent to have a 'channel' shape. Moreover, a guide groove is formed on the topside of the rotor brought contact with the fixing part. And, the frame is made of a metal-based material.

[0014] In another aspect of the present invention, there is provided a washing machine including an outer tub holding water, an inner tub in the outer tub to hold a laundry, an outer rotor type motor comprising a stator having an outer circumference on which a coil is wound, a rotor provided to leave a predetermined interval from an outside of the stator, the rotor rotating when a current is applied to the coil, and a frame having a fixing means for fixing the rotor wherein the fixing means is built in one body of an inner circumference of the frame, and a shaft connecting the motor to the inner tub.

[0015] In this case, the detailed elements of the washing machine are as good as those of the forgoing outer rotor type motor.

[0016] It is to be understood that both the foregoing explanation and the following detailed description of the present invention are exemplary and illustrative and are intended to provide further explanation of the invention as claimed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this application, illustrate embodiment(s) of the invention and together with the description serve to explain the principle of the invention. In the drawings:

[0018] FIG. 1 is a cross-sectional view of a washing machine;

[0019] FIG. 2 is a cross-sectional view of an outer rotor type motor of a washing machine according to a first embodiment of the present invention; and

[0020] FIG. 3 is a cross-sectional view of an outer rotor type motor of a washing machine according to a second embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT(S)

[0021] Reference will now be made in detail to the preferred embodiment(s) of the present invention, examples of which are illustrated in the accompanying drawings. Throughout the drawings, like elements are indicated using the same or similar reference designations where possible.

[0022] FIG. 1 is a cross-sectional view of a washing machine, and FIG. 2 is a cross-sectional view of an outer rotor type motor of a washing machine according to a first embodiment of the present invention.

[0023] Referring to FIG. 1, water is stored in an outer tub 24, and a laundry is put in an inner tub 22 provided in the outer tub 24. The inner tub 22 connected to a shaft 9 and a motor 10 provided under the washing machine is rotatably provided. A bearing housing 18 having a bearing loaded inside is provided under the outer tub 24.

[0024] Referring to FIG. 2, an outer rotor type motor includes a stator 5, a rotational frame 2, and a rotor 3.

[0025] The stator 5 is fixed to under the bearing housing 18. The stator 5 is formed circular. And, a coil 6 is wound up on an outer circumference of the stator 5. Moreover, the frame 2 is provided to leave a predetermined interval from the outer circumference of the stator 5. The rotor 3 made of magnet is provided on an inner circumference of the frame 2.

[0026] The shaft 9, as shown in FIG. 1, is provided to penetrate into a center of the frame 2, and a lower end of the shaft 9 is coupled with the frame by a coupling bolt 8.

[0027] A rotational magnetic field generated from applying a current to the coil 6 and a current induced to the rotor 3 reciprocally react to generate a torque rotating the rotor 3 according to Fleming's Left-hand Law. Hence, the stator 5 maintains stationary and the rotor 3 rotates by the torque centering on the shaft 9.

[0028] The rotor 3, as shown in FIG. 2, is coupled to the frame 2 by rivets 1. Namely, a plurality of rivets 1 are fixed to coupling holes perforated from a top of the rotor 2 to a bottom of the frame 2 so that the rotor 3 is fixed to an inside of the frame 2.

[0029] Hence, the rotor 3 rotates together with the frame 2. As the shaft 10 coupled to the frame 2 rotates, the inner tub 22 is selectively rotated by an action of a clutch 12.

[0030] In the first embodiment of the present invention, a plurality of the rivets 1 are additionally needed to fix the rotor 3 and a plurality of the coupling holes should be formed in the rotor 3 to have the rivets penetrate into.

[0031] Meanwhile, a simpler coupling structure between a rotor and a frame is provided in a second embodiment of the present invention.

[0032] FIG. 3 is a cross-sectional view of an outer rotor type motor of a washing machine according to a second embodiment of the present invention.

[0033] Referring to FIG. 3, an outer rotor type motor includes a rotor 23, a frame 22, a stator 25, and a coil 26.

[0034] The frame 22 forms an exterior of the motor, and a shaft 9 is provided to penetrate into a center of the frame 22. The rotor 23 is made of magnet and is provided along an inner circumference of the frame 22. The stator 25 is provided an inside of the frame 22 to leave a predetermined interval from the rotor 23. The stator 25 is fixed to a motor cover 27

over its topside. The motor cover 27 and the stator 25 are coupled to each other by a bolt 29. And, the coil 26 is wound up on an outer circumference of the stator 25.

[0035] A coupling structure of the above-explained elements is explained as follows.

[0036] Bolt coupling holes 30 are formed at corresponding positions of the stator 25 and the motor cover 27, respectively. The bolt 29 penetrates the bolt coupling holes 30 and a nut 28 is coupled to an end of the bolt 28, whereby the stator 25 is fixed to the bottom of the motor cover 27.

[0037] Meanwhile, the rotor 23 is fixed to an inner circumference of the frame 22. A fixing part 2, as shown in FIG. 3, is formed at a topside end of the frame 22 to be bent inward. And, a cross-section of the fixing part 21 has a channel shape. The fixing part 21 clamps a top of the rotor 22 to fix thereto. Namely, in the embodiment of the present invention, a fixing means of the rotator 21 is built in one body of the frame 22.

[0038] A guide groove 21 is formed at the topside of the rotor 23 brought contact with a tip of the fixing part 21. Hence, the tip of the fixing part 21 is inserted in the guide groove 21a to be able to clamp the topside of the rotor 23 uniformly.

[0039] An operation of the outer rotor type motor of the washing machine according to the second embodiment of the present invention is explained as follows.

[0040] Referring to FIG. 3, once power is applied to the coil 26 wound up on the outer circumference of the stator 23, a repulsive torque is generated between the stator 25 and the rotor 23 so that the rotor 23 rotates in a direction minimizing an electromagnetic resistance. In this case, the frame 22 coupled with the rotor 23 rotates at the same time.

[0041] If the rotor 23 and frame 22 fail to be securely coupled with each other, a connecting portion may be broken by vibrations of high-speed rotation. Namely, in order to prevent the vibrations from being generated between the frame 22 and the rotor 23, the

topside end of the frame 22 is bent inward to securely clamp the topside of the rotor 22 to fix thereto. Moreover, the fixing part 21 securely fixes the rotor 23 thereto to prevent the frame and rotor 22 and 23 from traveling.

[0042] In this case, the fixing part 21 and the frame 22 are preferably built in one body of metal. Hence, since the fixing part 21 is made of a metal-based material, it is facilitated to bend the fixing part 21 to implement the 'channel' shape.

[0043] Moreover, a fitting slot 3 is formed at a bottom center of the frame 22 to have the shaft 9 fitted thereto. A serration 24 having a pair of engaging micro-gears is formed at an inner circumference of the fitting slot 31 and a corresponding outer circumference of the shaft 9 in a direction of the shaft 9. Hence, the shaft 9, the frame 22, and the rotator 23 simultaneously rotate.

[0044] Referring to FIG. 1, once the torque generated from the rotator 23 is transferred to the shaft 9, the pulsator 20 or the tub 22 is selectively rotated by an operation of the clutch 12 connected to the shaft 9. Hence, the rotational force is transferred to the pulsator 20 in washing or to the pulsator and inner tub 20 and 22 in dewatering.

[0045] Accordingly, the outer rotor type motor according to the present invention has the following effects or advantages.

[0046] First of all, in order to fix the rotor to the inner lateral side of the rotational frame, one end of the frame is bent to fix the rotor thereto by clamping without a separate coupling means. Namely, the fixing means for fixing the rotor is built in one body of the rotational frame.

[0047] Therefore, the fixing mechanism of the rotor is simplified to reduce product cost and failure.

[0048] It will be apparent to those skilled in the art that various modifications and

variations can be made in the present invention without departing from the spirit or scope of the invention. Thus, it is intended that the present invention cover such modifications and variations, provided they come within the scope of the appended claims and their equivalents.